

Mathematics

(Chapter – 10) (Practical Geometry)
(Class – VII)

Exercise 10.1

Question 1:

Draw a line, say AB, take a point C outside it. Through C, draw a line parallel to AB using ruler and compasses only.

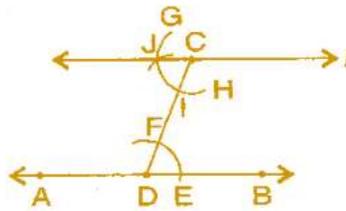
Answer 1:

To construct: A line, parallel to given line by using ruler and compasses.

Steps of construction:

- Draw a line-segment AB and take a point C outside AB.
- Take any point D on AB and join C to D.
- With D as centre and take convenient radius, draw an arc cutting AB at E and CD at F.
- With C as centre and same radius as in step 3, draw an arc GH cutting CD at I.
- With the same arc EF, draw the equal arc cutting GH at J.
- Join JC to draw a line l .

This the required line $AB \parallel l$.



Question 2:

Draw a line l . Draw a perpendicular to l at any point on l . On this perpendicular choose a point X, 4 cm away from l . Through X, draw a line m parallel to l .

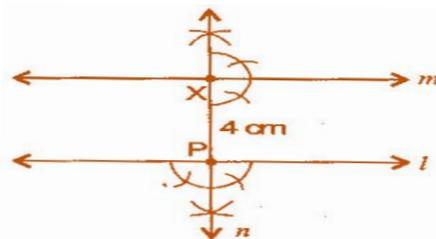
Answer 2:

To construct: A line parallel to given line when perpendicular line is also given.

Steps of construction:

- Draw a line l and take a point P on it.
- At point P, draw a perpendicular line n .
- Take $PX = 4$ cm on line n .
- At point X, again draw a perpendicular line m .

It is the required construction.



Question 3:

Let l be a line and P be a point not on l . Through P , draw a line m parallel to l . Now join P to any point Q on l . Choose any other point R on m . Through R , draw a line parallel to PQ . Let this meet l at S . What shape do the two sets of parallel lines enclose?

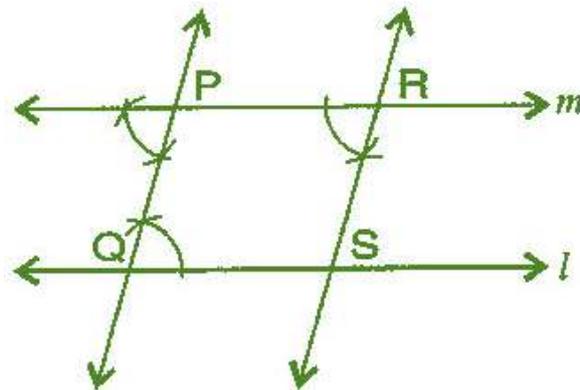
Answer 3:

To construct: A pair of parallel lines intersecting other part of parallel lines.

Steps of construction:

- Draw a line l and take a point P outside of l .
- Take point Q on line l and join PQ .
- Make equal angle at point P such that $\angle Q = \angle P$.
- Extend line at P to get line m .
- Similarly, take a point R on line m , at point R , draw angles such that $\angle P = \angle R$.
- Extended line at R which intersects at S on line l . Draw line RS .

Thus, we get parallelogram $PQRS$.



Exercise 10.2

Question 1:

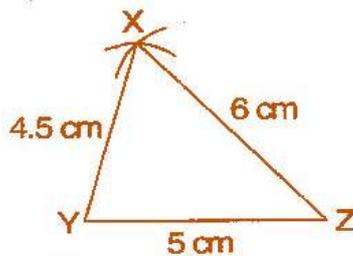
Construct $\triangle XYZ$ in which $XY = 4.5$ cm, $YZ = 5$ cm and $ZX = 6$ cm.

Answer 1:

To construct: $\triangle XYZ$, where $XY = 4.5$ cm, $YZ = 5$ cm and $ZX = 6$ cm.

Steps of construction:

- Draw a line segment $YZ = 5$ cm.
 - Taking Z as centre and radius 6 cm, draw an arc.
 - Similarly, taking Y as centre and radius 4.5 cm, draw another arc which intersects first arc at point X .
 - Join XY and XZ .
- It is the required $\triangle XYZ$.



Question 2:

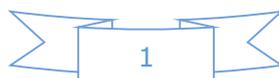
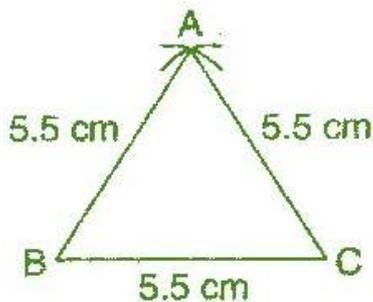
Construct an equilateral triangle of side 5.5 cm.

Answer 2:

To construct: A $\triangle ABC$ where $AB = BC = CA = 5.5$ cm

Steps of construction:

- Draw a line segment $BC = 5.5$ cm
 - Taking points B and C as centers and radius 5.5 cm, draw arcs which intersect at point A .
 - Join AB and AC .
- It is the required $\triangle ABC$.



Question 3:

Draw $\triangle PQR$ with $PQ = 4$ cm, $QR = 3.5$ cm and $PR = 4$ cm. What type of triangle is this?

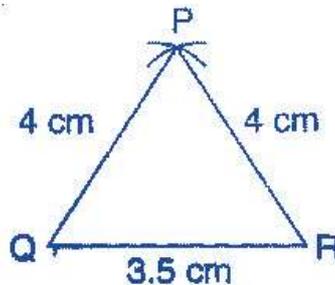
Answer 3:

To construction: $\triangle PQR$, in which $PQ = 4$ cm, $QR = 3.5$ cm and $PR = 4$ cm.

Steps of construction:

- Draw a line segment $QR = 3.5$ cm.
- Taking Q as centre and radius 4 cm, draw an arc.
- Similarly, taking R as centre and radius 4 cm, draw an another arc which intersects first arc at P .
- Join PQ and PR .

It is the required isosceles $\triangle PQR$.



Question 4:

Construct $\triangle ABC$ such that $AB = 2.5$ cm, $BC = 6$ cm and $AC = 6.5$ cm. Measure $\angle B$.

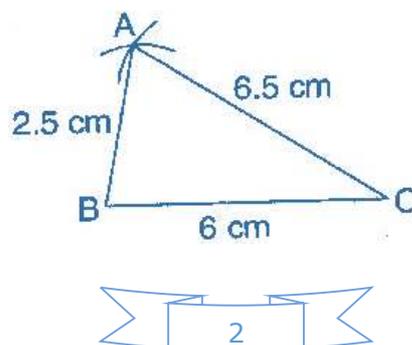
Answer 4:

To construct: $\triangle ABC$ in which $AB = 2.5$ cm, $BC = 6$ cm and $AC = 6.5$ cm.

Steps of construction:

- Draw a line segment $BC = 6$ cm.
- Taking B as centre and radius 2.5 cm, draw an arc.
- Similarly, taking C as centre and radius 6.5 cm, draw another arc which intersects first arc at point A .
- Join AB and AC .
- Measure angle B with the help of protractor.

It is the required $\triangle ABC$ where $\angle B = 80^\circ$.



Exercise 10.3

Question 1:

Construct $\triangle DEF$ such that $DE = 5$ cm, $DF = 3$ cm and $m\angle EDF = 90^\circ$.

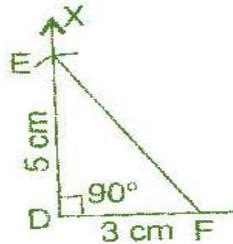
Answer 1:

To construct: $\triangle DEF$ where $DE = 5$ cm, $DF = 3$ cm and $m\angle EDF = 90^\circ$.

Steps of construction:

- Draw a line segment $DF = 3$ cm.
- At point D , draw an angle of 90° with the help of compass i.e., $\angle XDF = 90^\circ$.
- Taking D as centre, draw an arc of radius 5 cm, which cuts DX at the point E .
- Join EF .

It is the required right angled triangle DEF .



Question 2:

Construct an isosceles triangle in which the lengths of each of its equal sides is 6.5 cm and the angle between them is 110° .

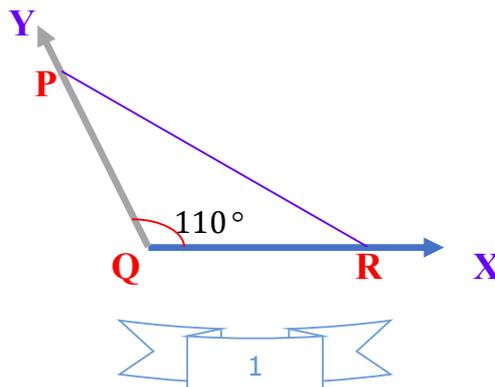
Answer 2:

To construct: An isosceles triangle PQR where $PQ = RQ = 6.5$ cm and $\angle Q = 110^\circ$.

Steps of construction:

- Draw a line segment $QR = 6.5$ cm.
- At point Q , draw an angle of 110° with the help of protractor, i.e., $\angle YQR = 110^\circ$.
- Taking Q as centre, draw an arc with radius 6.5 cm, which cuts QY at point P .
- Join PR

It is the required isosceles triangle PQR .



Question 3:

Construct $\triangle ABC$ with $BC = 7.5$ cm, $AC = 5$ cm and $m\angle C = 60^\circ$.

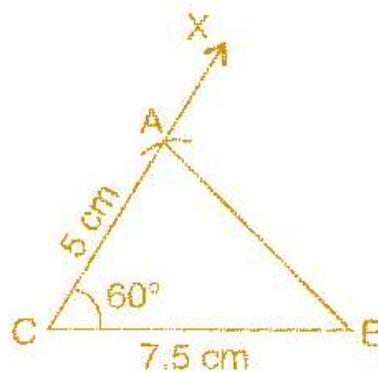
Answer 3:

To construct: $\triangle ABC$ where $BC = 7.5$ cm, $AC = 5$ cm and $m\angle C = 60^\circ$.

Steps of construction:

- (a) Draw a line segment $BC = 7.5$ cm.
- (b) At point C , draw an angle of 60° with the help of protractor, i.e., $\angle XCB = 60^\circ$.
- (c) Taking C as centre and radius 5 cm, draw an arc, which cuts XC at the point A .
- (d) Join AB

It is the required triangle ABC .



Exercise 10.4

Question 1:

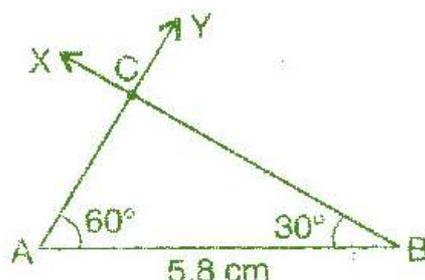
Construct $\triangle ABC$, given $m\angle A = 60^\circ$, $m\angle B = 30^\circ$ and $AB = 5.8$ cm.

Answer 1:

To construct: $\triangle ABC$ where $m\angle A = 60^\circ$, $m\angle B = 30^\circ$ and $AB = 5.8$ cm.

Steps of construction:

- Draw a line segment $AB = 5.8$ cm.
 - At point A, draw an angle $\angle YAB = 60^\circ$ with the help of compass.
 - At point B, draw $\angle XBA = 30^\circ$ with the help of compass.
 - AY and BX intersect at the point C.
- It is the required triangle ABC.



Question 2:

Construct $\triangle PQR$ if $PQ = 5$ cm, $m\angle PQR = 105^\circ$ and $m\angle QRP = 40^\circ$.

Answer 2:

Given: $m\angle PQR = 105^\circ$ and $m\angle QRP = 40^\circ$

We know that sum of angles of a triangle is 180° .

$$\therefore m\angle PQR + m\angle QRP + m\angle QPR = 180^\circ$$

$$\Rightarrow 105^\circ + 40^\circ + m\angle QPR = 180^\circ$$

$$\Rightarrow 145^\circ + m\angle QPR = 180^\circ$$

$$\Rightarrow m\angle QPR = 180^\circ - 145^\circ$$

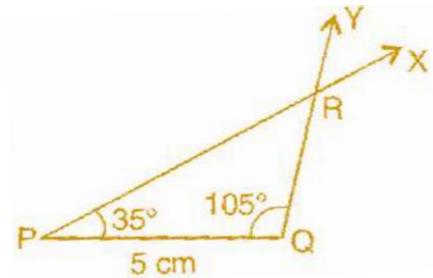
$$\Rightarrow m\angle QPR = 35^\circ$$

To construct: $\triangle PQR$ where $m\angle P = 35^\circ$, $m\angle Q = 105^\circ$ and $PQ = 5$ cm.

Steps of construction:

- Draw a line segment $PQ = 5$ cm.
- At point P, draw $\angle XPQ = 35^\circ$ with the help of protractor.
- At point Q, draw $\angle YQP = 105^\circ$ with the help of protractor.
- XP and YQ intersect at point R.

It is the required triangle PQR.



Question 3:

Examine whether you can construct $\triangle DEF$ such that $EF = 7.2$ cm, $m\angle E = 110^\circ$ and $m\angle F = 80^\circ$. Justify your answer.

Answer 3:

Given: In $\triangle DEF$, $m\angle E = 110^\circ$ and $m\angle F = 80^\circ$.

Using angle sum property of triangle

$$\angle D + \angle E + \angle F = 180^\circ$$

$$\Rightarrow \angle D + 110^\circ + 80^\circ = 180^\circ$$

$$\Rightarrow \angle D + 190^\circ = 180^\circ$$

$$\Rightarrow \angle D = 180^\circ - 190^\circ = -10^\circ$$

Which is not possible.

Exercise 10.5

Question 1:

Construct the right angled $\triangle PQR$, where $m\angle Q = 90^\circ$, $QR = 8$ cm and $PR = 10$ cm.

Answer 1:

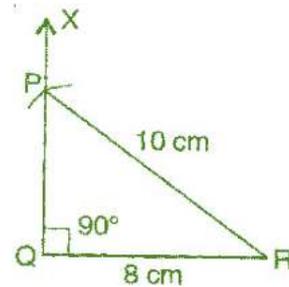
To construct:

A right angled triangle PQR where $m\angle Q = 90^\circ$, $QR = 8$ cm and $PQ = 10$ cm.

Steps of construction:

- Draw a line segment $QR = 8$ cm.
- At point Q , draw $QX \perp QR$.
- Taking R as centre, draw an arc of radius 10 cm.
- This arc cuts QX at point P .
- Join PQ .

It is the required right angled triangle PQR .



Question 2:

Construct a right angled triangle whose hypotenuse is 6 cm long and one the legs is 4 cm long.

Answer 2:

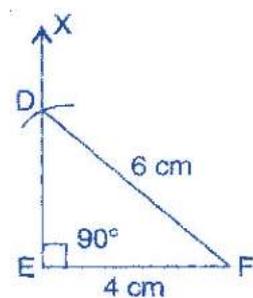
To construct:

A right angled triangle DEF where $DF = 6$ cm and $EF = 4$ cm

Steps of construction:

- Draw a line segment $EF = 4$ cm.
- At point E , draw $EX \perp EF$.
- Taking F as centre and radius 6 cm, draw an arc. (Hypotenuse)
- This arc cuts the EX at point D .
- Join DF .

It is the required right angled triangle DEF .



Question 3:

Construct an isosceles right angled triangle ABC, where $m\angle ACB = 90^\circ$ and $AC = 6$ cm.

Answer 3:

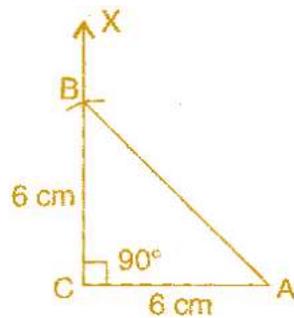
To construct:

An isosceles right angled triangle ABC where $m\angle C = 90^\circ$, $AC = BC = 6$ cm.

Steps of construction:

- (a) Draw a line segment $AC = 6$ cm.
- (b) At point C, draw $XC \perp CA$.
- (c) Taking C as centre and radius 6 cm, draw an arc.
- (d) This arc cuts CX at point B.
- (e) Join BA.

It is the required isosceles right angled triangle ABC.



Miscellaneous Questions

Questions:

Below are given the measures of certain sides and angles of triangles. Identify those which cannot be constructed and say why you cannot construct them. Construct rest of the triangle.

Triangle	Given measurements		
1. $\triangle ABC$	$m\angle A = 85^\circ$;	$m\angle B = 115^\circ$;	$AB = 5$ cm
2. $\triangle PQR$	$m\angle Q = 30^\circ$;	$m\angle R = 60^\circ$;	$QR = 4.7$ cm
3. $\triangle ABC$	$m\angle A = 70^\circ$;	$m\angle B = 50^\circ$;	$AC = 3$ cm
4. $\triangle LMN$	$m\angle L = 60^\circ$;	$m\angle N = 120^\circ$;	$LM = 5$ cm
5. $\triangle ABC$	$BC = 2$ cm;	$AB = 4$ cm;	$AC = 2$ cm
6. $\triangle PQR$	$PQ = 3.5$ cm;	$QR = 4$ cm;	$PR = 3.5$ cm
7. $\triangle XYZ$	$XY = 3$ cm;	$YZ = 4$ cm;	$XZ = 5$ cm
8. $\triangle DEF$	$DE = 4.5$ cm;	$EF = 5.5$ cm;	$DF = 4$ cm

Answer 1:

In $\triangle ABC$, $m\angle A = 85^\circ, m\angle B = 115^\circ, AB = 5$ cm

Construction of $\triangle ABC$ is not possible because $m\angle A + m\angle B = 200^\circ$, and we know that the sum of angles of a triangle should be 180° .

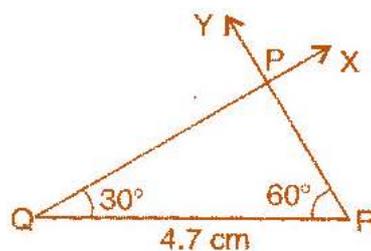
Answer 2:

To construct: $\triangle PQR$ where $m\angle Q = 30^\circ, m\angle R = 60^\circ$ and $QR = 4.7$ cm.

Steps of construction:

- (a) Draw a line segment $QR = 4.7$ cm.
- (b) At point Q, draw $\angle XQR = 30^\circ$ with the help of compass.
- (c) At point R, draw $\angle YRQ = 60^\circ$ with the help of compass.
- (d) QX and RY intersect at point P.

It is the required triangle PQR.



Answer 3:

We know that the sum of angles of a triangle is 180° .

$$\therefore m\angle A + m\angle B + m\angle C = 180^\circ$$

$$\Rightarrow 70^\circ + 50^\circ + m\angle C = 180^\circ$$

$$\Rightarrow 120^\circ + m\angle C = 180^\circ$$

$$\Rightarrow m\angle C = 180^\circ - 120^\circ$$

$$\Rightarrow m\angle C = 60^\circ$$

To construct: $\triangle ABC$ where $m\angle A = 70^\circ$, $m\angle C = 60^\circ$ and $AC = 3$ cm.

Steps of construction:

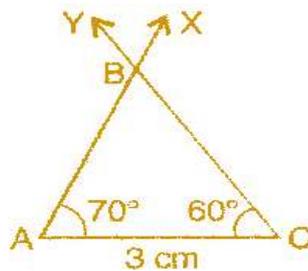
(a) Draw a line segment $AC = 3$ cm.

(b) At point C, draw $\angle YCA = 60^\circ$.

(c) At point A, draw $\angle XAC = 70^\circ$.

(d) Rays XA and YC intersect at point B

It is the required triangle ABC.



Answer 4:

In $\triangle LMN$, $m\angle L = 60^\circ$, $m\angle N = 120^\circ$, $LM = 5$ cm

This $\triangle LMN$ is not possible to construct because $m\angle L + m\angle N = 60^\circ + 120^\circ = 180^\circ$ which forms a linear pair.

Answer 5:

$\triangle ABC$, $BC = 2$ cm, $AB = 4$ cm and $AC = 2$ cm

This $\triangle ABC$ is not possible to construct because the condition is

Sum of lengths of two sides of a triangle should be greater than the third side.

$$AB < BC + AC$$

$$\Rightarrow 4 < 2 + 2$$

$$\Rightarrow 4 = 4,$$

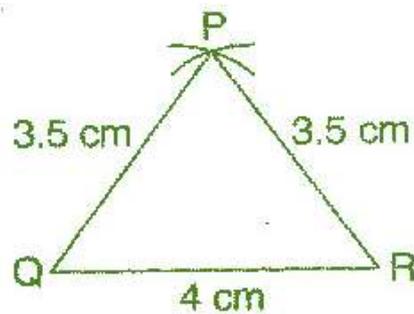
Answer 6:

To construct: $\triangle PQR$ where $PQ = 3.5$ cm, $QR = 4$ cm and $PR = 3.5$ cm

Steps of construction:

- Draw a line segment $QR = 4$ cm.
- Taking Q as centre and radius 3.5 cm, draw an arc.
- Similarly, taking R as centre and radius 3.5 cm, draw an another arc which intersects the first arc at point P .

It is the required triangle PQR .



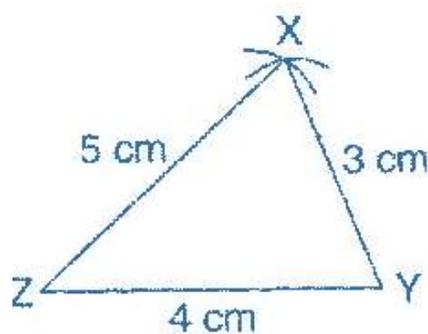
Answer 7:

To construct: A triangle whose sides are $XY = 3$ cm, $YZ = 4$ cm and $XZ = 5$ cm.

Steps of construction:

- Draw a line segment $ZY = 4$ cm.
- Taking Z as centre and radius 5 cm, draw an arc.
- Taking Y as centre and radius 3 cm, draw another arc.
- Both arcs intersect at point X .

It is the required triangle XYZ .



 **Answer 8:**

To construct:

A triangle DEF whose sides are $DE = 4.5$ cm, $EF = 5.5$ cm and $DF = 4$ cm.

Steps of construction:

(a) Draw a line segment $EF = 5.5$ cm.

(b) Taking E as centre and radius 4.5 cm, draw an arc.

(c) Taking F as centre and radius 4 cm, draw an another arc which intersects the first arc at point D.

It is the required triangle DEF.

